AVIATION & HEARING CONSERVATION

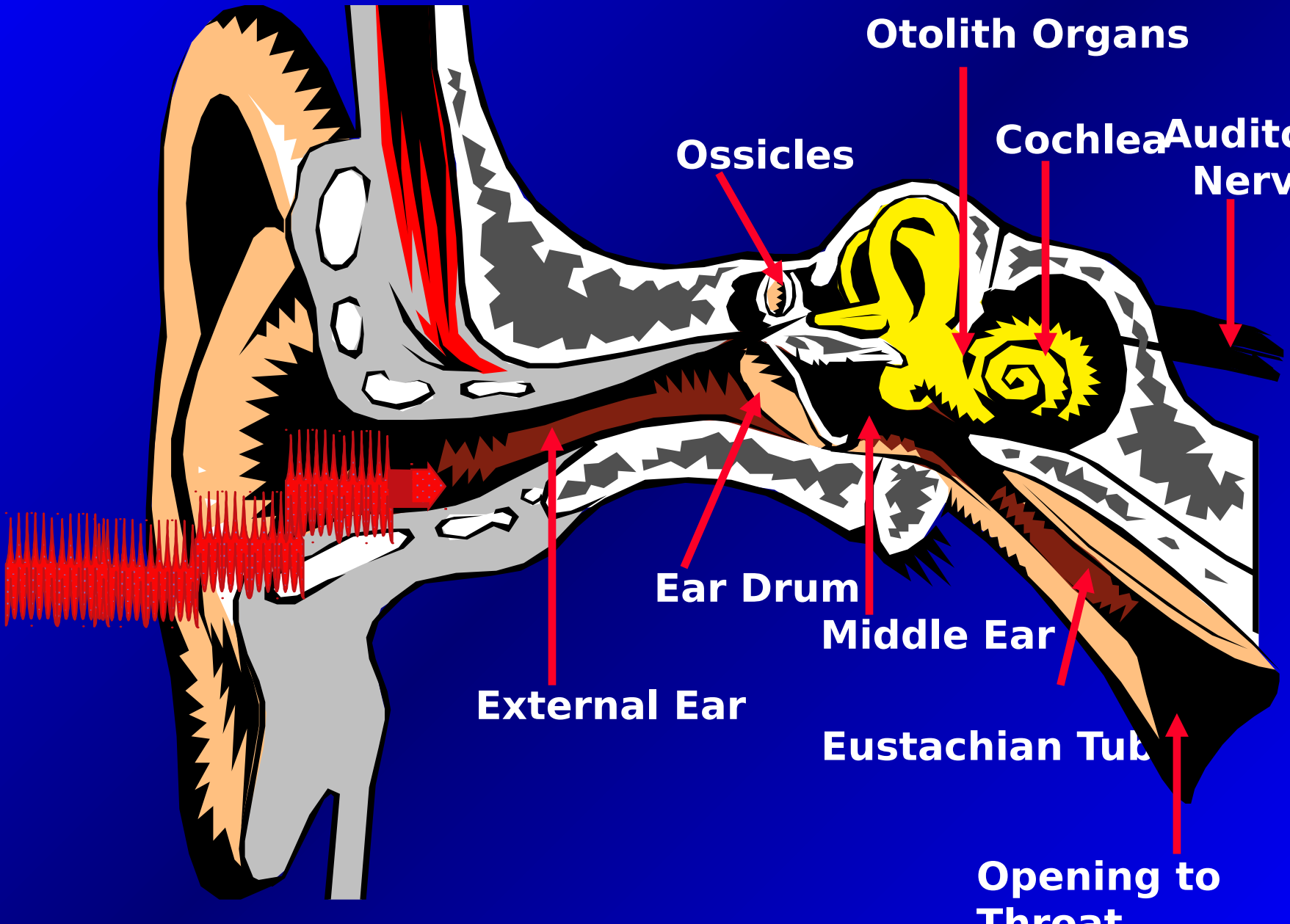
Hearing Conservation Section

Ft. Stewart & Hunter AAF

Parts of the Ear

- Outer Ear
- Middle Ear
- Inner Ear

Perception of Sound



Causes of Conductive Hearing Loss

- Middle ear infection
- Foreign body in ear
- Congenital malformation

Causes of Sensorineural Hearing Loss

- Childhood illness
- Presbycusis
- Congenital
- Medications
- Infections
- Medications
- High fever
- **NOISE EXPOSURE**

Receptors of Sound

- Detect fluid movement in the cochlea
- Transmit electrical impulses to the brain where sound is interpreted

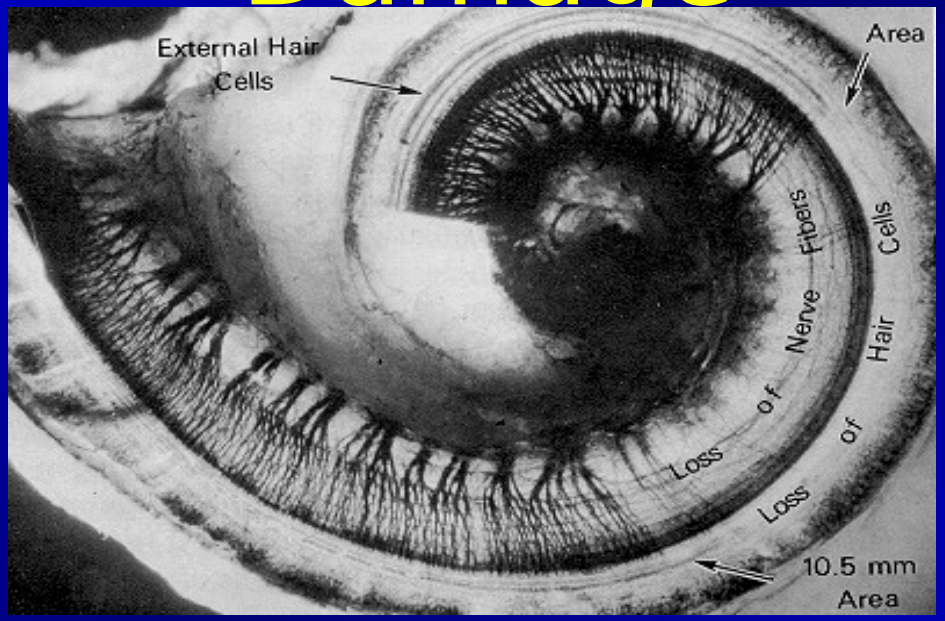
Types of Hearing Loss

- Conductive hearing loss
  - Outer or middle ear
- Sensorineural hearing loss
  - Inner ear
- Mixed hearing loss

Damaged Hair Cells

- Damaged hair cells in the various bundles means loss of sound perception

Long Term Hair Cells Damage



- Prolonged, unprotected exposure to noise could cause irreversible damage.

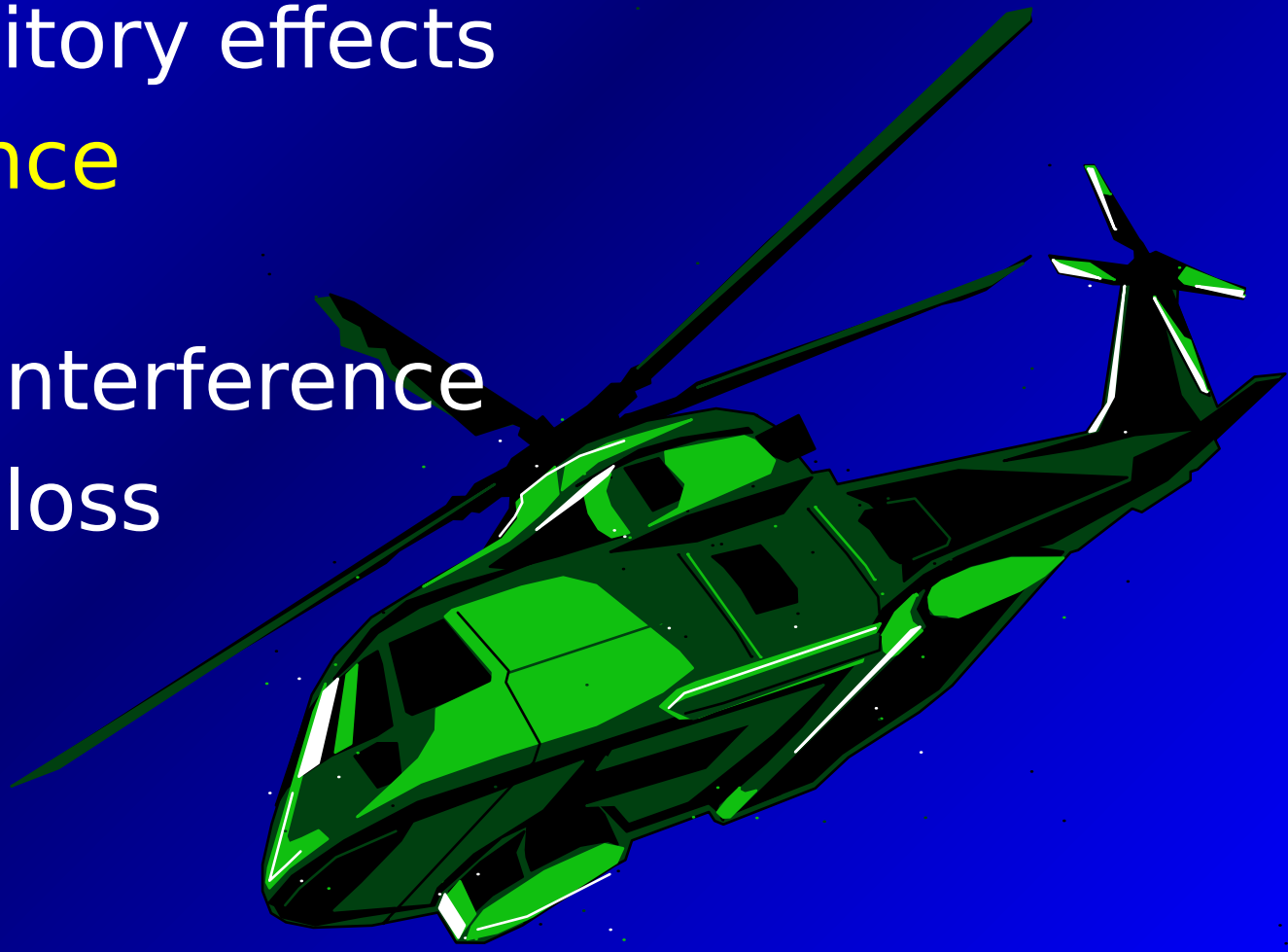
Typical Noise Levels

- Rustling leaves 20dB
- Whisper 35 dB
- Normal conversation 65dB
- Diesel truck at 25 feet 92dB
- M16 rifle 156dB peak SPL
- M60 machine gun 160dB peak SPL
- 155 mm Howitzer 185dB peak SPL

Effects of Noise

- Non-auditory effects

  Annoyance
  Fatigue
- Speech interference
- Hearing loss



How loud is allowed?

Intensity (dBA)	Time (hours)
80 dBA	16 hours
85 dBA	8 hours
87 dBA	6 hours
90 dBA	4 hours
92 dBA	3 hours
95 dBA	2 hours
97 dBA	1.5 hours
100 dBA	1 hour
105 dBA	0.5 hour
110 dBA	0.25 hour

Noise Induced Hearing Loss

- Painless
- Progressive
- Permanent
- **PREVENTABLE**

Noise Induced Hearing Loss

- Temporary Threshold Shift (TTS)
  - Hearing recovers eventually
  - Fullness, tinnitus
- Permanent Threshold Shift (PTS)
  - No recovery
  - Treatment is hearing aids

Audiometric Hearing Levels

Frequency Tested (Hz)	Hearing Threshold (dB)
500	25 / 25
1000	25 / 25
2000	25 / 25
3000	35 / 35
4000	45 / 55
6000	45 / 65

* Class 1
* Class 2, 3, 4
* Only Physicians May Diagnose Hearing Loss

Noise in Army Aircrafts (General Findings)

- Overall noise levels are equal to or exceed **100 dB**
- Most intense noise below 300 Hz
- Low frequency noise will produce high frequency hearing loss

Must Use Hearing Protection

Rotary-Wing Aircrafts Noise Levels

Aircraft	125	250	500	1000	2000	4000	8000	dB
UH-1	106	101	101	98	89	86	83	102
AH-1	104	98	93	95	89	81	73	105
OH-58C	105	98	94	90	88	83	65	103
OH-58D	102	94	91	88	86	78	70	100
CH-47D	106	103	97	97	100	109	105	112

Rotary-Wing Aircrafts Noise Levels

Aircraft dB	125	250	500	1000	2000	4000	8000
UH-60A	114	110	106	101	97	92	94	108
AH-64	NA	NA	NA	NA	NA	NA	NA	NA
TH-67	NA	NA	NA	NA	NA	NA	NA	NA
RAH-66	NA	NA	NA	NA	NA	NA	NA	NA

* “ NA ” indicates incoming new data or data not available

Components of the Army HCP

- Noise hazard identification
- Engineering controls
- Hearing protection
- Monitoring audiometry
- Annual health education
- Enforcement
- Program evaluation

Noise Hazard Identification

- Noise surveys and site visits conducted by industrial hygiene
- When noise levels exceed Army standards, noise signs/decals must be posted in area (unit commander or supervisor responsibility)

Engineering Controls

- Noise control at the source is most desirable
- Hard to do after the fact
- Most practical at early stages of procurement

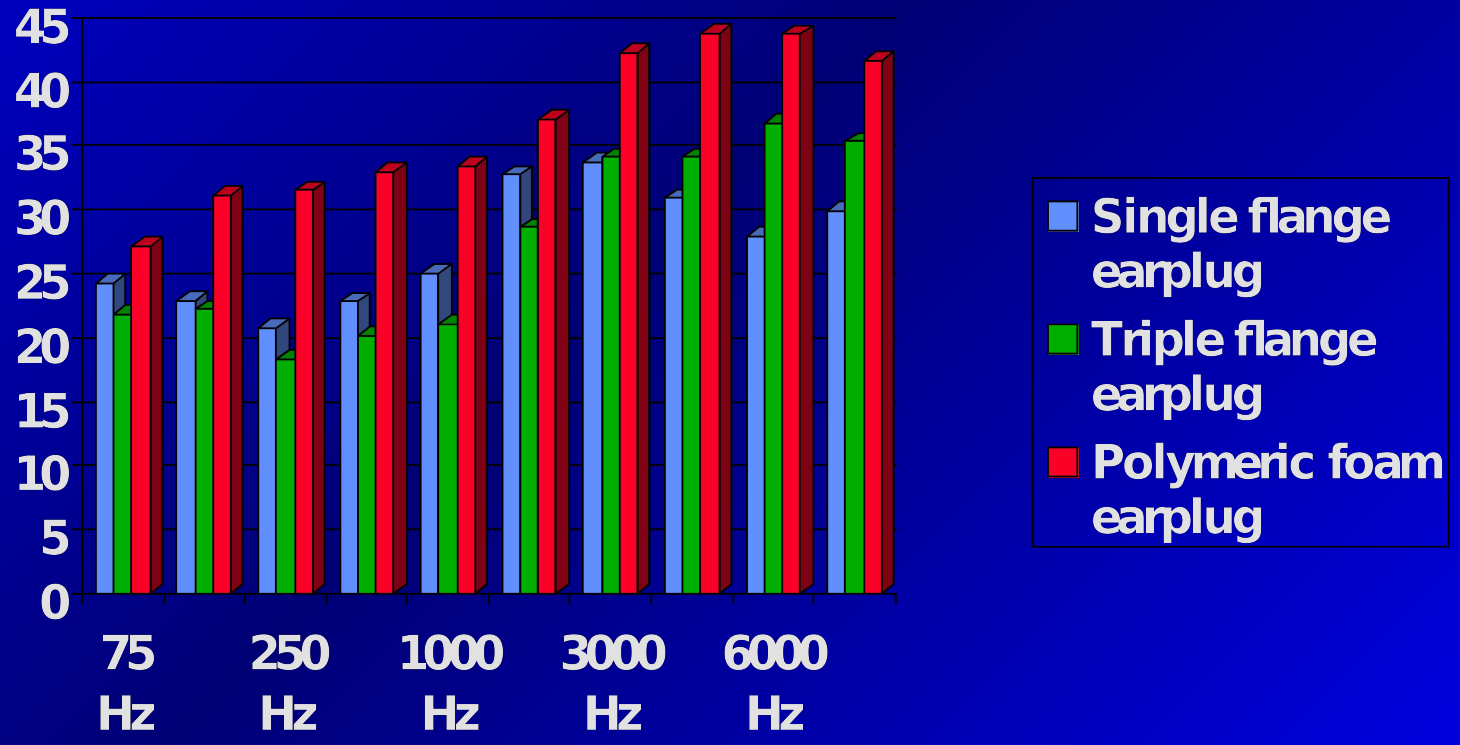
Noise Control at the Source

- Enclosures
- Acoustical treatment
- Mufflers
- Control vibration
- Partial height barriers

Hearing Protection

- Ear plugs -
  - hand formed
  - triple/single flange
  - custom
- Ear canal caps
- Noise muffs
- Helmets

Mean Real Ear Sound Attenuation In Decibels



Mean Real Ear Sound Attenuation in Decibels

Hertz	Single flange	Triple flange	Foam ear plugs
75	24.3	21.8	27.1
125	22.9	22.2	31.1
250	20.8	18.3	31.5
500	22.8	20.1	33.0
1000	25.0	21.0	33.4
2000	32.7	28.6	37.1
3000	33.7	34.1	42.2
4000	30.9	34.1	43.8
6000	27.9	36.7	43.7
8000	29.9	35.5	41.6

Hearing Protection

- Responsibility
  - ALL personnel in noise hazardous areas
  - Individual responsibility to wear hearing protection
- Issued free of charge
- Unit hearing conservation responsible for keeping adequate supply of ear plugs

Effective Exposure Levels

Protective Helmets / Headsets

Aircraft	Hearing Protector	EEL
AH-1S	HGU-56	77.0
	SPH-4B	77.4
	SPH-4	83.2
UH-1H	HGU-56	81.3
	SPH-4B	81.0
	SPH-4	85.9
OH-58D	HGU-56	81.6
	SPH-4B	81.5
	SPH-4	86.3

Effective Exposure Levels

Protective Helmets / Headsets (cont.)

Aircraft	Hearing Protector	EEL
OH-58C	HGU-56	76.9
	SPH-4B	76.8
	SPH-4	81.4
UH-60A	HGU-56	90.6
	SPH-4B	90.6
	SPH-4	95.1
CH-47D	HGU-56	86.8

Protective Helmets and Ear Plugs

Protector	UH-60A	CH-47D	AH-1S	OH-58	UH-1H
	120 kn	100 kn	100 kn	100 kn	100 kn
SPH-4 w/ triple flange plug	72.6	77.5	70.2	65.7	70.7
SPH-4 w/ single flange plug	75.3	78.4	71.5	67.4	71.9
SPH-4 w/ foam plug	70.4	77.3	68.8	63.5	68.8

Non-Occupational Noise Exposure

Activity	Noise Level
• Single engine aircraft	90 dB
• Shotgun	130 dB
• Bartending	95 - 110 dB
• Music at the club	130 dB
• Lawn mowers	95 -100 dB
• Vacuum cleaners	95 - 100 dB

Hearing Protection

- Care and maintenance
  - Ear plugs and be washed and reused
  - Noise muffs and helmets must be fitted correctly, ear cups and chin straps must be maintained

Monitoring Audiometry

- Annual requirement
- Testing done by microprocesser audiometer
- DD2215 is baseline evaluation
- DD2216 is annual evaluation
- Individuals with a significant shift in hearing are referred to an Audiologist for diagnostic testing

Health Education

- At least annually
- Can be done in form of films, video, or lecture
- Posters, pamphlets, videos, and films can be ordered through commercial sources or your local audiovisual support center

Enforcement

- Unit commander or supervisor is responsible for enforcing the HCP to include use of hearing protection
- Failure to comply with the HCP requirements can result in disciplinary action for both military and civilian employees

Program Evaluation

- Participation
- Quality Assurance
- Program Effectiveness

QUESTIONS ??